cular overload may first become manifest during emergence from anesthesia when the vasodilatory effects of anesthetic drugs and techniques are dissipated or positive pressure ventilation is discontinued. Hyskon may directly cause a coagulopathy.

Both 1.5% glycine and a premixture of 2.7% sorbitol and 0.54% mannitol are low-viscosity, hypo-osmolar (200 and 178 mOsm per liter, respectively), rapidly metabolized instilling fluids. Excessive absorption can result in substantial hyponatremia and hypo-osmolemia.

A solution of 5% mannitol may have a wider margin of safety compared with the other instilling fluids because it is iso-osmolar (278 mOsm per liter). In fact, mannitol is commonly administered intravenously during neuroanesthesia, often in volumes and concentrations greater than those encountered in operative hysteroscopy and without pathophysiologic sequelae. Excessive intravascular absorption of instilled 5% mannitol solution will cause hyponatremia, but serum osmolarity will not change. Furthermore, mannitol initiates a diuresis that self-corrects volume overload.

Although treatment regimens for hyponatremia, hypo-osmolemia, and circulatory overload are well established, anesthetic management of these otherwise healthy women should emphasize the prevention of the OHIA syndrome and its attendant morbidity and possible mortality.

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## Desflurane—A New Inhalation Anesthetic

BEFORE 1993, three volatile inhalation anesthetics were in routine use. These inhalation anesthetics—halothane, enflurane, and isoflurane—have many desirable qualities. As the number of outpatient procedures continues to increase, recent emphasis in anesthetic practice has been toward the development of agents that provide more rapid recovery. A new inhalation anesthetic, desflurane, provides more precise control during delivery and more rapid recovery than preexisting inhalation anesthetics. These improved properties result from its low blood-gas solubility coefficient, which promotes more rapid induction and emergence from anesthesia. This blood-gas solubility coefficient is 0.45, which is similar to cyclopropane (0.42) and nitrous oxide (0.47) and less than half that of isoflurane (1.4). Sevoflurane is another new inhalational agent that has a low solubility coefficient (0.60), but it is still undergoing clinical trials for approval by the Food and Drug Administration.

Desflurane was recently released for clinical use in the United States. Because its high vapor pressure at 20°C is 669 mm of mercury, desflurane is near its boiling point at room temperature. Accurate delivery must be accomplished by using a heated vaporizer that maintains its near-constant temperature, converting desflurane to a gas and then blending this gas with fresh gas flow. In addition to its lower blood-gas solubility, another of desflurane's attractive properties is its low level of biotransformation in the body. Many of the toxicities attributed to earlier inhalation anesthetics are caused by metabolites from hepatic biotransformation. Desflurane is biotransformed at less than an eighth the rate of isoflurane, which previously had been the least biotransformed inhalation agent. In addition, it has excellent physical stability. Its effect on vital organ systems, when higher concentrations are used, is similar to that of existing inhalation agents. It depresses ventilation, lowers mean arterial pressure, and causes some cerebral vasodilation.

Desflurane differs from sevoflurane in several ways: it is stable in carbon dioxide absorbents where sevoflurane has some instability, it undergoes much less hepatic biotransformation than sevoflurane, it may produce a tachycardia at higher concentrations, and its pungency produces airway irritation that precludes its use for inhalation inductions in children.

Desflurane should not produce hepatotoxicity of the form observed with halothane. Although it is not perfect, it does appear to offer specific advantages over previous agents. Cost-benefit comparisons with existing inhalational agents will be another important consideration.

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## Intraspinal Narcotics for Obstetric Analgesia

THE USE OF intraspinal narcotics has found widespread acceptance in obstetric analgesia, but has generally been confined to epidural administration. A better understanding of the pharmacology of narcotics and advances in the equipment available have led to the increasing use of intrathecal narcotics in labor. This technique is now a reasonable alternative for women in early labor, in particular, and perhaps a cost-effective alternative in obstetric centers without full-time "in-house" obstetric anesthesia services.

The early use of intrathecal morphine sulfate for labor was effective, but the side effects of pruritus, nausea, and vomiting and the limitations of a single injection (that is, no easy route for further intervention) and its slow onset (30 to 90 minutes) led to its near abandonment. The technique was recently "reinvented," however. The problem of a slow onset was solved by adding one of the lipid-

soluble narcotics, fentanyl citrate (25 μg) or sufentanil citrate (10 μg), to intrathecal morphine (0.1 to 0.3 mg). The lipid-soluble narcotic rapidly penetrates neural tissue, and thus, analgesia is achieved within minutes, allowing morphine to become effective later. The lipid-soluble narcotics provide brief (60 to 90 minute) analgesia, whereas the morphine may provide hours of pain relief. A second advancement was the introduction of both a combined spinal-epidural technique and long pencil-point spinal needles. Using the latter produces a low incidence of postdural puncture headaches (< 1%). The needles can be passed through a standard epidural needle, thus allowing the administration of intrathecal narcotics—morphine, fentanyl, or sufentanil, and possibly small doses of lidocaine or bupivacaine hydrochloride—before placing an epidural catheter. The catheter can then be used for further labor analgesia as needed or for a surgical delivery with concentrated local anesthetics, given epidurally, if indicated.

The use of the combined spinal-epidural technique has been particularly helpful for patients in early labor or for those seeking a more natural delivery—that is, some analgesia but full or greater motor control. This technique has even permitted women to ambulate during labor and is commonly referred to as a "walking epidural." It may also be useful in small community hospitals unable to provide 24-hour epidural anesthesia coverage. Intrathecal narcotics can be administered to provide some pain relief and the catheter then used for further labor analgesia or possible surgical intervention.

This technique is not without side effects. Pruritus is common (50%) and must be treated aggressively (using nalbuphine hydrochloride or naloxone hydrochloride) if the patient is to be comfortable. Nausea and vomiting also occur, but to a lesser extent (30%). Mild hypotension and even respiratory depression have also been reported. Further, narcotics alone provide only analgesia, which may not be sufficient pain relief for many women in active labor who will require further intervention, such as epidural analgesia with a local anesthetic. The use of intrathecal narcotics for labor and of the combined spinal-epidural technique has added an important new choice for labor analgesia.

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## New Advances in Airway Management

IN THE PAST, clinicians faced with patients requiring ventilation had limited options short of tracheotomy: ventilate by mask or intubate by blind nasal intubation or direct laryngoscopy. Inadequate ventilation due to unsuccessful management of a patient's airway has been shown to be the main cause of brain damage or death. The American Society of Anesthesiologists' "difficult airway" algorithm presents a logical progression of alternative airway management techniques after failed intubation.

One of the key issues for managing the airway is having several options available to physicians to handle the many different airway scenarios. Two new and innovative methods can help: laryngeal mask airway and esophageal-tracheal combination tube.

The laryngeal mask airway consists of a conventional plastic tracheal tube in which the distal end has been replaced by a miniature inflatable face mask. It is inserted blindly through the oral cavity so that the distal end, once inflated, forms an oval seal around the laryngeal inlet. It allows for both oxygenation and ventilation. Both medical and paramedical personnel have a higher rate of success in placing the laryngeal mask airway than inserting an endotracheal tube by standard laryngoscopy. The laryngeal mask airway has few contraindications, the most important ones being patients with a full stomach, massive obesity, hiatal hernia, or gastroesophageal paresis.

The esophageal-tracheal combination tube, in contrast to the laryngeal mask, has been approved for use during cardiopulmonary resuscitation both in hospitals and in the field. It consists of a double-lumen tube with two inflatable balloon cuffs. The proximal (or pharyngeal) cuff replaces the face mask of the old esophageal obturator airway. The "esophageal" lumen has a distal blocked end and perforations at the level of the pharynx. The second lumen resembles a conventional endotracheal tube. The combination tube is inserted blindly through the oral cavity, and regardless of whether esophageal or tracheal intubation is accomplished, the physician is able to ventilate the patient using the appropriate proximal lumen. This combination tube also has contraindications, the most important being esophageal disease. In summary, both methods can be life saving and are especially helpful to physicians who rarely do laryngoscopy.

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